

What is claimed is:

1. Apparatus for grading and identification of a gemstone comprising:
a housing;
5 a platform mounted in said housing for supporting a gemstone;
first means disposed within said housing for illuminating a gemstone
supported by said platform;
means for displacing said platform in said housing;
an electronic camera mounted in said housing for viewing a gemstone
10 on said platform, said camera being adapted for generating electronic image
signals corresponding to a physical characteristic of the gemstone;
an electronic data processor operatively connected to said displacing
means and said electronic camera, said electronic data processor being
programmed with an instruction set for controlling said displacing means and
15 said electronic camera, and for receiving and storing the electronic image
signals.
2. Apparatus as set forth in Claim 1 wherein said platform is mounted
on an axis, and said displacing means comprises:
20 means for moving said platform along an axis thereof; and
means for rotating said platform about said axis.
3. Apparatus as set forth in Claim 1 wherein said first illuminating means
comprises;
25 a first light source disposed beneath said platform; and
a second light source disposed above said platform.
4. Apparatus as set forth in Claim 3 further comprising:
a first light directing means disposed between said first light source
30 and said platform; and

a second light directing means disposed between said second light source and said platform.

5 5. Apparatus as set forth in Claim 1 wherein said platform comprises a transparent portion for supporting the gemstone, whereby light emitted from said illuminating means is permitted to impinge on the gemstone.

10 6. Apparatus as set forth in Claim 1 comprising display means operatively connected to said electronic data processor for displaying images of the gemstones based on the electronic image signals.

7. Apparatus as set forth in Claim 1 comprising means for displacing said camera along an axis that is perpendicular to the axis of said platform.

15 8. Apparatus as set forth in Claim 1 comprising:
a light filter; and
filter support means disposed between said camera and said platform for supporting said light filter.

20 9. Apparatus as set forth in Claim 8 further comprising filter replacement means for inserting and removing said light filter.

10. Apparatus as set forth in Claim 1 comprising a motor driven fan for circulating air inside said housing.

25 11. Apparatus as set forth in Claim 1 wherein said housing comprises an opening and a dust filter disposed in said opening.

12. Apparatus as set forth in Claim 1 further comprising an ultraviolet light source disposed in said housing for illuminating the gemstone with ultraviolet light.
- 5 13. Apparatus as set forth in Claim 1 wherein said electronic data processor generates a data file containing information on the physical characteristic of the gemstone based on the electronic image signals and the electronic data processor comprises a data storage device for storing the data file for later retrieval.
- 10 14. Apparatus as set forth in Claim 13 wherein said electronic data processor comprises means for retrieving the data file from the data storage device and communicating said data file to a second data processor whereby the second data processor generates an appraisal report relative to the
- 15 15. Apparatus as set forth in Claim 1 further comprising second illumination means disposed within said housing for backlighting the gemstone on said platform relative to said electronic camera.
- 20 16. Apparatus as set forth in Claim 15 comprising a third illumination means disposed within said housing for frontlighting the gemstone on said platform relative to said electronic camera.
- 25 17. A system for generating, maintaining, and retrieving characterizing information about gemstones comprising:
- an electronic camera for viewing a gemstone and being adapted for generating electronic image signals corresponding to a physical characteristic of the gemstone;
 - 30 an electronic data processor operatively connected to said electronic

camera for receiving the electronic image signals and being programmed with an instruction set for controlling said electronic camera and processing the electronic signals to provide a data file containing information identifying a physical characteristic of the gemstone;

- 5 a central processing apparatus including a central data processor and a central data storage device; and

 communication means for providing a data communication link between said electronic data processor and said central data processor, whereby data files containing information identifying a physical characteristic of a gemstone can be transferred between said electronic data processor and
10 said central data processor.

18. A system as set forth in Claim 17 wherein the central processing apparatus contains a database of information identifying a plurality of
15 gemstones and the central data processor is programmed for retrieving information from said database identifying a gemstone by a physical characteristic thereof.

19. A system as set forth in Claim 18 wherein said central data processor
20 is programmed for comparing the gemstone identifying information from said database to gemstone identifying information received from said electronic data processor whereby the gemstone viewed by the electronic camera can be accurately identified.

20. A method of grading the value of a gemstone by its ultraviolet color profile, the method comprising the steps of:

- placing the gemstone within an area substantially free of light;
 illuminating the gemstone simultaneously with ultra violet light and diffused light;
30 capturing the light incident to the gemstone with a CCD camera

and storing it in a memory device as an image data set;

discontinuing the illumination of the gem by the ultra violet light, and continuing the illumination by diffused light;

5 capturing the light incident to the gemstone from the continued illumination with the CCD camera and storing it in the memory device as a second image data set;

comparing the first and second captured data sets; and

determining the level of gemstone fluorescence by way of the captured data comparisons.

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21. A method of analyzing incident and reflected light data for use in grading a gemstone, the method comprising the steps of:

15 placing the gemstone on a platform at a first position within an area substantially free of light, providing a translucent portion in said platform circumscribing the gemstone periphery;

positioning a data responsive element of a CCD having a focal axis aligned with said first position of the platform, linking the CCD camera to a data processor operating an instruction set;

20 illuminating the bottom side of the gemstone through the translucent platform portion from a position beneath the platform;

illuminating the gemstone from a lateral side thereof in the direction of the light responsive element of the camera;

rotating the platform about its central axis according to said data processor instruction set; and

25 capturing the incident light data with the CCD camera and storing it in said memory as an image data set.

22. A method of analyzing incident and reflected light data for use in grading a gemstone, the method comprising the steps of:

30 placing the gemstone on a platform at a first position within an

area substantially free of light, and providing the platform with a translucent portion therethrough underlying said gemstone and circumscribing the gemstone periphery;

5 positioning the data responsive element of a CCD having a focal axis aligned with said first position of the platform, the CCD camera operably linked to a data processor operating an instruction set the data processor storing captured light data in a memory device;

illuminating the gemstone with an ultraviolet light source;
10 illuminating the gemstone with a D 55 light source from beneath the translucent portion of said platform; and

capturing the incident light data with the CCD camera and storing it in said memory as an image data set.

23. The method of claim 22 wherein the D 55 light source is a circular ring
15 light.

24. The method of claim 22 including the step of translating the CCD camera along the focal axis to positions defined by the instruction set of the data processor.

20 25. A method of analyzing incident and reflected light data for use in grading a gemstone, the method comprising the steps of:

placing the gemstone on a platform at a first position within an area substantially free of light, providing in the platform a translucent portion for supporting the gemstone and circumscribing the gemstone periphery;

25 positioning a data responsive element of a CCD having a focal axis aligned with said first position of the platform, the CCD camera operably linked to a data processor operating an instruction set and adapted to travel from a first position to a second position along the focal axis, the data processor storing captured light data in a memory device;

30 moving the platform upwardly with respect to the focal axis;

positioning a refractor element having an angle of refraction in alignment with the focal axis;

moving the camera towards the refractor element along the focal axis to the second position;

5 illuminating the gemstone from a position beneath the translucent portion of the platform; and

capturing the incident light data redirected by the refractor element with the CCD camera and storing it in said memory as an image data set.

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26. The method of claim 25 wherein the distance between the first and second camera positions on the focal axis is equivalent to the distance traveled the platform upwardly from the focal axis.

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27. A method of analyzing incident and reflected light data for use in grading a gemstone, the method comprising the steps of:

placing the gemstone on a platform having a translucent portion thereon at a first position within an area substantially free of light, the platform translucent portion circumscribing the gemstone periphery;

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positioning the data responsive element of a CCD having a focal axis aligned with said first position of the platform, the CCD camera operably linked to a data processor operating an instruction set and adapted to travel from a first position to a second position along the focal axis, the data processor storing captured light data in a memory device;

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moving the platform upwardly with respect to the focal axis; positioning a refractor element having an angle of refraction in alignment with the focal axis;

moving the camera towards the refractor element along the focal axis to the second position;

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illuminating the gemstone from a position beneath the platform;

capturing the incident light data redirected by the refractor element with the CCD camera and storing it in said memory as an image data set;

- 5 disabling the illumination from beneath the platform;
 illuminating the gemstone from above the platform;
 capturing the incident light data redirected by the refractor element with the CCD camera and storing it in said memory as an image set;
 disabling the illumination from beneath the platform;
 illuminating the gemstone from a second light source from
10 beneath the platform; and
 capturing the incident light data redirected by the refractor element with the CCD camera and storing it in said memory as an image data set.

- 15 28. A method of analyzing incident and reflected light data for use in grading a gemstone, the method comprising the steps of:

- placing the gemstone on a platform at a first position within an area substantially free of light, the platform having a translucent portion thereon circumscribing the gemstone periphery;
- 20 positioning the data responsive element of a CCD having a focal axis aligned with said first position of the platform, the CCD camera operably linked to a data processor operating an instruction set and adapted to travel from a first position to a second position along the focal axis, the data processor storing captured light data in a memory device;
- 25 moving the platform downwardly with respect to the focal axis;
 positioning a light redirecting element having an angle of redirection in alignment with the focal axis;
 moving the camera towards the refractor element along the focal axis to the second position;
- 30 illuminating the gemstone from simultaneously with two light

sources from above the platform;

illuminating the gemstone from a side position directed towards
the data responsive element of the camera; and

5 capturing the incident light data routed by the light redirecting
element with the CCD camera and storing it in said memory as an image
data set.

29. The method of claim 28 wherein the step of placing the gemstone on the
platform translucent portion further comprises centering the gemstone on the
10 translucent portion with a laser light source passing through the center of said
translucent portion.

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